



**QUEEN'S
UNIVERSITY
BELFAST**

Reading critically: Evaluating context, evidence and claims in science-based media reports.

McClune, W. (2018). *Reading critically: Evaluating context, evidence and claims in science-based media reports..* Paper presented at NARST Annual conference 2018:
Recentring on Scientific Literacy in an era of Science Mistrust and Misunderstanding, Atlanta, Georgia, United States.

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights
Copyright 2018 The Author

General rights
Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

READING CRITICALLY: EVALUATING CONTEXT, EVIDENCE AND CLAIMS IN SCIENCE-BASED MEDIA REPORTS.

Dr Billy McClune

Queen's University, Belfast, United Kingdom

ABSTRACT

Science news reported in the media sways opinions and influences decision-making in relation to science-based issues. In addition, within a community the level of science literacy will influence the public attitude and response to science issues. These claims underpin the concern of science educators to prepare young people for meaningful involvement with science based issues and debates that are of relevance to them and impact on their wellbeing and that of their communities. This paper reports on a study of a curricular intervention for pupils (age 11-14 years) in the UK aimed at developing critical reading literacy using science based media reports. In particular the study focused on the core reading literacy skills of interpreting and evaluating in the context of science-based media reports. The study relies on classroom observation and analysis of a programme of science lessons based on science news media resources. It included a number of media based reading activities and suggested both individual and group work tasks. Researchers noted negotiation among pupils to achieve agreement within the group as they developed and consolidated their critical reading skills in the context of science-based media reports. Following the programme of activities competency tasks were used to assess pupils' capability as critical consumers of science presented as news. Data sources included video recordings, pupils' class work and assessment tasks. In addition pupils completed a questionnaire and researchers conducted semi-structured interviews. Pupils demonstrated a grasp of foundational critical reading elements however their mastery of intermediate and higher level skills was limited. Competency in these skill areas was best illustrated in the context of collaborative working. Media reports intended to communicate science research and innovation provide opportunities for teachers to develop among their pupils the critical reading skills that are essential for promoting literacy in science.

KEY WORDS:

Science Literacy, Reasoning, Classroom Observation

READING CRITICALLY: EVALUATING QUESTIONS, EVIDENCE AND CLAIMS IN SCIENCE-BASED MEDIA REPORTS.

News is pervasive and young people who do not systematically tune-in to news broadcasts are nevertheless aware of newsworthy incidents and issues including science-based issues reported in the media. News can be used to contextualise science and suggest innovative and stimulating ways to promote literacy in science in particular the capacity to read and respond critically to news with a science component. (Millar and Osborne 1998). Science issues are discussed in social and news media and science literacy levels within a community will be a factor in how these issues are understood and addressed. To be relevant and useful science education must engender a level of critical science literacy that can keep pace with the increasing popularity of science in news and social media contexts. Hence the calls for science literacy to include the ability to read with understanding media reports with a science component Millar & Osborne (1998), Millar (2006), National Research Council

(2012), Schramm (2002) remain pertinent. The rationale underpinning this study suggests that science literacy in its broadest sense is indivisible from general literacy (Norris & Phillips 2003). The model of critical engagement that informed the study specifically addresses science media (McClune & Jarman 2010).

This study set out to observe and analyse the use of adapted media reports as a context for interdisciplinary learning. It reports on the reading literacy outcomes of a curricular innovation involving pupils aged 11 – 14 years. The research question focused on evidence of pupils' critical reading capability in particular: What levels of critical reading do pupils display when accessing media reports with a science component?

METHODS

This empirical study was conducted in upper primary and secondary schools and involved 325 pupils. Teachers aimed to use news reports of science studies to promote critical reading. Media based resources and teaching strategies were based on approaches developed by Jarman and McClune (2011). The model of critical reading was adapted from that described in OECD (2015). Over several science lessons pupils completed both individual and group work tasks. Sample of lessons were observed. Other data sources included video recordings of pupil conversations and individual and group assessment tasks. Researchers accessed samples of pupils' individual and group class work and scrutinised video recordings. During the programme of activities competency tasks were used to assess pupils' capability as critical consumers of science news. Finally pupils completed an end of programme questionnaire and researchers conducted a number of semi-structured interviews.

In a follow-up study an efficacy randomised controlled trial involving *** upper primary pupils provided further evidence of both strengths and limitations of pupils critical reading of science based news reports.

RESULTS

Findings relate to the critical reading skills of: i) accessing information; ii) interpreting text; and iii) evaluating and responding to media reports. Most pupils were able to demonstrate competency in this basic level critical reading task. Pupils were consistently able to retrieve science related information from the text and identify elements of the study design. Pupils performed similarly when working in familiar and unfamiliar contexts.

Pupils' capacity to interpret text was more limited. Many pupils had difficulty distinguishing between the evidence presented and claims that were made or identifying the question researchers were trying to answer. In addition most pupils overestimated the certainty of text and displayed misplaced confidence in the reported outcomes. In this element of critical reading pupils working individually had the lowest competence levels. This was particularly true when engaging with unfamiliar text. While pupils working together were able collectively to demonstrate good levels of interpretive ability there were noticeable and persistent limitations. In particular the ability of groups of pupils to correctly interpret the level of certainty in the text was limited. As with pupils working individually, those working collaboratively most commonly overestimated the degree of certainty that could be attached to the outcomes of the scientific study. Pupils working in groups who used dialogue and

negotiation were better able complete the tasks and exhibit interpretative ability often demonstrating a high degree of complexity in their answers.

Outcomes of an exploratory randomised controlled trial complemented observations from the classroom. A small positive effect indicating an improvement in critical reading capability was associated with an intervention promoting core critical reading skills needed to access, interpret and respond critically to media reports with a science component. This study also indicated a decline in pupils' capability as the level of challenge increased from foundation to higher-level skills.

4. DISCUSSION AND CONCLUSION

These studies would suggest that inability to identify the purpose of a reported research study limits the capacity of the reader to critically evaluate the text. Consequently pupils may apply the research findings too generally to situations where the research was not relevant or apply the findings inappropriately and draw conclusions which exceed the validity of the study. In addition when pupils have difficulty distinguishing between claims and evidence the important thread connecting research question, evidence and claim is easily lost. This can hinder text evaluation and subsequently limit the pupils' capacity for a critical response.

When pupils fail to identify limiting clauses in the text they often overestimated the level of certainty in the science report. This may leave the reader vulnerable to the consequences of misplaced confidence in the reported outcomes. It was noted that pupils working in groups were better able complete the tasks requiring interpretative ability. The benefit of negotiating an agreed outcome was evident in analysis of pupil–pupil interactions. Critical thinking challenges presented as group tasks in the classroom may more closely resemble informal out of school contexts where media reports are a usual source of science knowledge for the community. In respect of scientific and socio-scientific issues pupils can benefit from working collaboratively.

Evidence would suggest that in making a response to media reports pupils working collaboratively appear to distinguish between irrational responses and identify a structure for a well-founded critical response. However, individuals may not adopt this framework when they address a similar higher order challenge such as making a personal response to a science based news report.

Exposing pupils to science based media reports is an effective way to promote and evaluate elements of critical reading in science. Skills developed in class and working with teacher support were retained and successfully applied in unfamiliar media contexts. This points to the transferability of these skills and suggests the potential benefits of interdisciplinary collaboration. Pupils may be expected to improve over time allowing for pupils developing maturity in relation to science based media reports. Further longitudinal studies would be needed.

REFERENCES

- Jarman, R & McClune, B. 2011. *Science Newswise 2*. Association for Science Education. Hatfield, UK
- McClune, B. & Jarman, R. (2010). Critical reading of science-based news reports: Establishing a knowledge skills and attitudes framework. *International Journal of Science Education*, 32 (6), 727-752
- Millar, R., & Osborne, J., (1998). *Beyond 2000: Science education for the future: A report with ten recommendations*. London: King's College London, School of Education
- Millar, R. (2006) Twenty First Century Science: Insights from the design and implementation of a scientific literacy approach in school science. *International Journal of Science Education* 28(13) 1499 – 1521
- Norris, S. P. and Phillips, L. M. (2003), How literacy in its fundamental sense is central to scientific literacy. *Science. Education.*, 87: 224–240.
- National Research Council (2012) *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioural and Social Sciences and Education. Washington, D.C: The National Academies Press
- OECD (2015) PISA Draft reading literacy framework
<https://www.oecd.org/pisa/pisaproducts/Draft%20PISA%202015%20Reading%20Framework%20.pdf> (accessed August 2016)
- Schramm, S. L. (2002). *Transforming the Curriculum: Thinking Outside the Box*. Lanham, Maryland: Scarecrow Press.